

# Drug overdose epidemic has been growing exponentially for decades

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Death rates from drug overdoses in the U.S. have been on an exponential growth curve that began at least 15 years before the mid-1990s surge in opioid prescribing, suggesting that overdose death rates may continue along this same historical growth trajectory for years to come, according to a University of Pittsburgh Graduate School of Public Health analysis published today in *Science*.

The type of drug and the demographics of those who die from overdoses has fluctuated over the years. When the use of one drug waned, a new drug filled in, attracting new populations from different geographic regions at faster rates. These findings suggest that, to be successful, prevention efforts must extend beyond control of specific drugs to address deeper factors driving the epidemic.

"The current epidemic of [overdose](#) deaths due to prescription opioids, heroin and fentanyl appears to be the most recent manifestation of a more fundamental, longer-term process," said senior author Donald S. Burke, M.D., Pitt Public Health dean and UPMC-Jonas Salk Chair of Global Health. "Understanding the forces holding these

multiple individual drug epidemics together in a tight upward exponential trajectory will be important in revealing the root causes of the epidemic, and this understanding could be crucial to prevention and intervention strategies."

Burke and his team collected all the accidental drug poisoning—overdose—deaths reported through the U.S. National Vital Statistics System since 1979, when drug overdoses began to be reported in their own category. In the past nearly four decades, the drug overdoses plot as a near-perfect curve, with each yearly data point falling almost exactly on the smooth upward exponential curve.

"This remarkably smooth, long-term epidemic growth pattern really caught our attention," Burke said. "If we can figure it out, we should be able to bend that curve downward."

The team then examined overdose [death](#) rates for individual drug types, such as cocaine, heroin and prescription opioids, which began to be reported in 1999. What they found was far from perfect.

"There is no regular or predictable pattern to the overdose rates for any of these drugs. Cocaine overdose death rates curved down and up and down and back up over the past 20 years. Methadone deaths have been on a downturn since the mid-2000s. Prescription opioids have been on a fairly steady, steep climb. Heroin deaths shot up in 2010, followed in 2013 by synthetic opioids, such as fentanyl. Methamphetamine appears to be on the verge of its own dramatic climb," said lead author Hawre Jalal, M.D., Ph.D., assistant professor of health policy and management at Pitt Public Health. "Nonetheless, when we plot the annual sum of all drug overdoses, we get a remarkably smooth, inexorable exponential curve."

The team also explored the underlying demographics—age, race, gender and geographic location—of the people who died of drug overdoses.

Again, they found great variability depending on the type of drug. Heroin and cocaine impact urban populations, whereas [prescription opioids](#) and methamphetamine skew a bit more rural. Cocaine has higher death rates in black men than other populations. When it comes to heroin, younger whites and older blacks have higher death rates.

But, when the overall demographics are combined for all types of drugs, a clear picture emerges of growing [death rates](#) spreading across people ages 20 through 65 as the years tick by.

When overdoses are plotted on a U.S. map, certain drugs dominate different areas. But, when taken as a whole, almost every region in the country is a hotspot for overdose deaths from one or more drugs, with the exception of the north central states.

None of these analyses suggest an obvious mechanism as to how multiple, drug-specific sub-epidemics have merged into a single, tight, exponential curve. However, the researchers believe that improved communications and supply chains, efficiencies in drug manufacturing, expanding [drug](#) markets and lower prices could all be making illicit drugs more available, while sociological and psychological forces, such as loss of purpose, dissolution of communities and despair, could be accelerating demand.

"This is a paradox—inexorable growth in the aggregate, composed of variable sub-epidemics," said Burke. "But it should be solvable. Evidence-based [public health](#) responses have contained past epidemics. If we understand and address these root causes at the same time that we take on the opioid crisis, we should be able to curb the epidemic for good."

**More information:** H. Jalal et al., "Changing dynamics of the drug overdose epidemic in the United States from 1979 through 2016," *Science* (2018). [science.sciencemag.org/cgi/doi/.../1126/science.aau1184](https://doi.org/10.1126/science.aau1184)

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